1. Evaluate the integrals:

   (a) $\int_2^5 \frac{3x-5}{x^3} dx$.

   (b) $\int_3^5 \frac{dx}{x^2(x-3)}$.

   (c) $\int_\pi^{7\pi/2} \frac{\cot(x)+\sin^2(x)}{4}$.

2. Find $F'(3)$ where

$$F(x) = \int_{\cos(4\pi x)}^{e^{1/x}} \frac{3x^2}{x+2} dx$$

3. (Optional) Let $f(1/x) = f(x)$ and f be an odd function. If $\int_{1/2}^{1/4} f(x)\frac{dx}{x^2} = 3$. Then compute

$$\int_{-4}^{2} (f(x) + 3x^2 - 5)dx$$

4. a) Given the function below, evaluate $\int_1^9 f(x)dx$.

$$f(x) = \begin{cases} x^2+4 & x < 4 \\ \sqrt{x} - x & x \geq 4. \end{cases}$$

   b) Would you get the same answer to part (a) if you evaluated $F(9) - F(1)$? What does this tell you about the FTC and continuity?

5. (a) Evaluate the expressions:

$$\int x(x+1)dx \quad \text{and} \quad \int x dx \int (x+1)dx$$

   b) Looking at your answer in part (a), what, if anything, can you say in general about $\int f(x)g(x)dx$?

6. For each integral below, determine if we can evaluate the integral using the method of u-substitution. If the answer is "yes", detect u.

   a) $\int \frac{1}{x^2} \sec(\frac{1}{x}) \tan(\frac{1}{x})dx$.

   b) $\int x \csc^2(x)dx$.

   c) $\int e^{x^2} dx$.

7. Determine if each statement below is true or false.

(a) If f is a continuous function, then the function $F(x) = \int_a^x f(t)dt$ is an anti-derivative of f.

(b) If F is an anti-derivative of f, then $\int_a^b f(t)dt$ represents the slope of the secant line of $F(x)$ on the interval $[a, b]$.

(c) $\frac{d}{dx}\left(\int_a^b f(t)dt\right) = f(b)$.

(d) Given that f is continuous on $[a, b]$ and $F'(x) = f(x)$, then $F(b) - F(a)$ represents the net area bounded by the graph of $y = f(x)$, the lines $x = a$, $x = b$, and the x-axis.